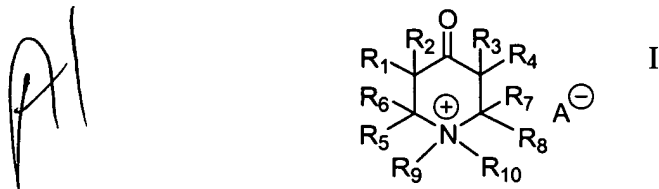


IN THE CLAIMS:

1. (Currently Amended) A method of producing mostly 5 β ,6 β -epoxides of steroids from Δ^5 -unsaturated steroids by an epoxidation reaction using a ketone and an oxidizing agent under conditions effective to generate epoxides,

wherein said ketone is selected from compounds of generic formula I,



R_1 or R_4 in formula (I) is selected from alkyl, halogenated alkyl, aryl, $\Theta R \underline{R}_y$ (where $\underline{R}_y = H$, alkyl or aryl), $\Theta \underline{C} \underline{O} \underline{R} \underline{O} \underline{C} \underline{O} \underline{R}_y$ (where $\underline{R}_y = H$, alkyl or aryl), $\Theta \underline{C} \underline{O} \underline{O} \underline{R} \underline{O} \underline{C} \underline{O} \underline{O} \underline{R}_y$ (where $\underline{R}_y = \text{alkyl or aryl}$), $\underline{O} \underline{C} \underline{O} \underline{O} \underline{C} \underline{H}_2 \underline{R}_z$ (where $\underline{R}_z = \text{aryl}$), $\Theta \underline{C} \underline{O} \underline{N} \underline{R}_1 \underline{R}_2 \underline{O} \underline{C} \underline{O} \underline{N} \underline{R}_u \underline{R}_v$ (where $\underline{R}_1 \underline{R}_u$ or $\underline{R}_2 \underline{R}_v = H$, alkyl or aryl), $\Theta \underline{S} \underline{i} \underline{R}_1 \underline{R}_2 \underline{R}_3 \underline{O} \underline{S} \underline{i} \underline{R}_w \underline{R}_x \underline{R}_y$ (where $\underline{R}_1 \underline{R}_w$, $\underline{R}_2 \underline{R}_x$ or $\underline{R}_3 \underline{R}_y = \text{alkyl or aryl}$), and halogen;

R_2 or R_3 in formula (I) is selected from H, alkyl, halogenated alkyl, aryl, $\Theta R \underline{R}_y$ (where $\underline{R}_y = H$, alkyl or aryl), $\Theta \underline{C} \underline{O} \underline{R} \underline{O} \underline{C} \underline{O} \underline{R}_y$ (where $\underline{R}_y = H$, alkyl or aryl), $\Theta \underline{C} \underline{O} \underline{O} \underline{R} \underline{O} \underline{C} \underline{O} \underline{O} \underline{R}_y$ (where $\underline{R}_y = \text{alkyl or aryl}$), $\underline{O} \underline{C} \underline{O} \underline{O} \underline{C} \underline{H}_2 \underline{R}_z$ (where $\underline{R}_z = \text{aryl}$), $\Theta \underline{C} \underline{O} \underline{N} \underline{R}_1 \underline{R}_2 \underline{O} \underline{C} \underline{O} \underline{N} \underline{R}_u \underline{R}_v$ (where $\underline{R}_1 \underline{R}_u$ or $\underline{R}_2 \underline{R}_v = H$, alkyl or aryl), $\Theta \underline{S} \underline{i} \underline{R}_1 \underline{R}_2 \underline{R}_3 \underline{O} \underline{S} \underline{i} \underline{R}_w \underline{R}_x \underline{R}_y$ (where $\underline{R}_1 \underline{R}_w$, $\underline{R}_2 \underline{R}_x$ or $\underline{R}_3 \underline{R}_y = \text{alkyl or aryl}$), and halogen;

R_5 , R_6 , R_7 or R_8 in formula (I) is selected from H, alkyl, halogenated alkyl, aryl, $\underline{C} \underline{O} \underline{O} \underline{R} \underline{C} \underline{O} \underline{O} \underline{R}_y$ (where $\underline{R}_y = H$, alkyl or aryl), and $\underline{C} \underline{O} \underline{N} \underline{R}_1 \underline{R}_2 \underline{C} \underline{O} \underline{N} \underline{R}_u \underline{R}_v$ (where $\underline{R}_1 \underline{R}_u$ or $\underline{R}_2 \underline{R}_v = H$, alkyl or aryl);

R_9 or R_{10} in formula (I) is selected from alkyl, halogenated alkyl, and aryl; and

A in formula (I) is selected from halogen, OTf, BF₄, OAc, NO₃, BPh₄, PF₆, and SbF₆.

2. (Original) The method of claim 1 wherein said oxidizing reagent is selected from the group consisting of potassium peroxomonosulfate, sodium hypochlorite, sodium perborate, hydrogen peroxide, and peracids.

Amended
3. (Original) The method of claim 2 wherein said epoxidation reaction is carried out using potassium peroxomonosulfate as an oxidizing agent.

4. (Currently Amended) The method of claim 1 wherein said epoxidation reaction is carried out in a homogeneous solvent system ~~containing~~selected from dimethoxymethane-acetonitrile-water, acetonitrile-water, acetone-water, dioxane-water, dimethoxyethane-water, and tetrahydrofuran-water, or a biphasic solvent system ~~containing~~selected from dichloromethane-water, chloroform-water, benzene-water, toluene-water, dimethoxymethane-water, or diethylether-water, or mixtures thereof.

5. (Original) The method of claim 1 wherein said epoxidation reaction is carried out at a temperature within the range from about -10 °C to about 40 °C.

6. (Original) The method of claim 5 wherein said epoxidation reaction is carried out at room temperature.

7. (Original) The method of claim 1 wherein said epoxidation reaction is carried out at a pH within the range from about 7.0 to about 12.0.

8. (Original) The method of claim 7 wherein said pH is within the range from about 7.0 to about 7.5.

9. (Original) The method of claim 7 wherein said pH is controlled by using a pH-stat or a buffer.

10. (Currently Amended) The method of claim 9 wherein said buffer is selected from the ~~solutions~~group consisting of solutions of sodium bicarbonate, sodium carbonate, sodium borate, sodium hydrogenphosphate, sodium dihydrogenphosphate, sodium hydroxide, potassium hydrogenphosphate, potassium dihydrogenphosphate, potassium bicarbonate, potassium carbonate, potassium hydroxide, ~~or~~and mixtures thereof.

11. (Original) The method of claim 1 wherein said epoxidation reaction provides said epoxides in at least about 5:1 β/α -epoxide ratio.

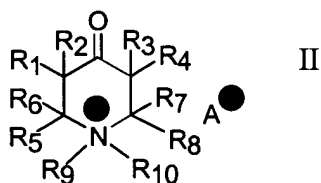
12. (Original) A method of producing mostly 5 β ,6 β -epoxides of steroids from Δ^5 -unsaturated steroids having a substituent at the 3 α -position by an epoxidation reaction using a ketone and an oxidizing agent under conditions effective to generate epoxides.

13. (Currently Amended) The method of claim 12 wherein said substituent is selected from OR_y (where $R_y = H$, alkyl or aryl), $O(CH_2)_nOR_y$ (where $n = 1, 2$ or 3 , $R_y = H$, alkyl or aryl), $O(CH_2)_mSO_nR_y$ (where $n = 1, 2$ or 3 ; $m = 0, 1$ or 2 ; $R_y = H$, alkyl or aryl), $OSiR_1R_2R_3$, $OSiR_wR_xR_y$ (where R_1, R_2 or R_3 , R_w, R_x or R_y = alkyl or aryl), OSO_nR_y (where $n = 0, 1$ or 2 ; $R_y = H$, alkyl or aryl), OCO_nR_y (where $n = 1$ or 2 ; $R_y = H$, alkyl or aryl), $OCONR_1R_2$, $OCONR_uR_v$ (where R_1 or R_2 , R_u or R_v = H , alkyl or aryl), OPO_nR_y (where $n = 2$ or 3 ; $R_y =$ alkyl or aryl), NR_1R_2 , NR_uR_v (where R_1 or R_2 , R_u or R_v = H ,

alkyl or aryl), $\text{NR}_1\text{CO}_n\text{R}_2$ $\text{NR}_u\text{CO}_n\text{R}_v$ (where $n = 1$ or 2 ; R_1 or R_2 R_u or $\text{R}_v = \text{H}$, alkyl or aryl), $\text{NR}_1\text{CONR}_2\text{R}_3$ $\text{NR}_u\text{CONR}_v\text{R}_w$ (where R_1 , R_2 or R_3 R_u , R_v or $\text{R}_w = \text{H}$, alkyl or aryl), $\text{NR}_1\text{SO}_n\text{R}_2$ $\text{NR}_v\text{SO}_n\text{R}_w$ (where $n = 1$ or 2 ; R_1 $\text{R}_v = \text{H}$, alkyl or aryl, R_2 $\text{R}_w = \text{alkyl or aryl}$), NPhth (Phth = phthaloyl group), $^+\text{NR}_1\text{R}_2\text{R}_3$ $^+\text{NR}_u\text{R}_v\text{R}_w$ (where R_1 , R_2 or R_3 R_u , R_v or $\text{R}_w = \text{H}$, alkyl or aryl), $\text{SiR}_1\text{R}_2\text{R}_3$ $\text{SiR}_u\text{R}_v\text{R}_w$ (where R_1 , R_2 or R_3 R_u , R_v or $\text{R}_w = \text{H}$, alkyl or aryl), SO_nR_v (where $n = 0, 1$ or 2 ; $\text{R}_v = \text{H}$, alkyl or aryl), SCO_nR_v (where $n = 1$ or 2 ; $\text{R}_v = \text{H}$, alkyl or aryl), halogen, CN, NO_2 , alkyl, aryl, COOR_v (where $\text{R}_v = \text{H}$, alkyl or aryl), and CONR_1R_2 CONR_uR_v (where R_1 or R_2 R_u or $\text{R}_v = \text{H}$, alkyl or aryl).

14. (Original) The method of claim 12 wherein said Δ^5 -unsaturated steroid having a substituent at the 3α -position is selected from the group consisting of Δ^5 -unsaturated steroids having a ketal derivative of ketone group or a thioketal derivative of ketone group at the 3-position.

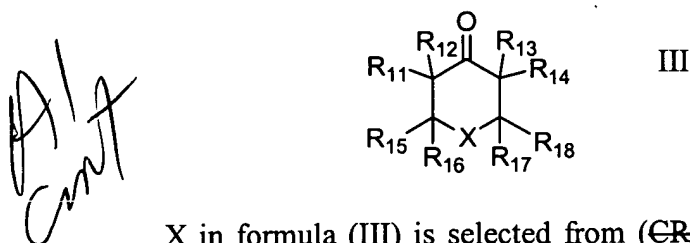
15. (Currently Amended) The method of claim 12 wherein said ketone is selected from the group consisting of compounds of generic formula II, III, IV, and V wherein



R_1 , R_2 , R_3 , or R_4 in formula (II) is selected from H, alkyl, halogenated alkyl, aryl, OROR_v (where $\text{R}_v = \text{H}$, alkyl or aryl), OCOROCOR_v (where $\text{R}_v = \text{H}$, alkyl or aryl), OCOROCOCOR_v (where $\text{R}_v = \text{alkyl or aryl}$), OCONR_1R_2 OCONR_uR_v (where R_1 R_u or R_2 $\text{R}_v = \text{H}$, alkyl or aryl), $\text{OSiR}_1\text{R}_2\text{R}_3$ $\text{OSiR}_u\text{R}_v\text{R}_w$ (where R_1 , R_u , R_2 R_v or R_3 $\text{R}_w = \text{alkyl or aryl}$), and halogen;

R_5, R_6, R_7, R_8, R_9 or R_{10} in formula (II) is selected from H, alkyl, halogenated alkyl, aryl, COORCOOR_v (where $\text{RR}_v = \text{H, alkyl or aryl}$), and $\text{CONR}_1\text{R}_2\text{CONR}_u\text{R}_v$ (where R_1R_u or $\text{R}_2\text{R}_v = \text{H, alkyl or aryl}$);

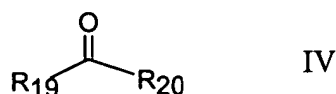
A in formula (II) is selected from halogen, OTf, BF_4 , OAc, NO_3 , BPh_4 , PF_6 , and SbF_6 ;



X in formula (III) is selected from $(\text{CR}_1\text{R}_2\text{CR}_u\text{R}_v)_n$ (where $n = 1, 2, 3, 4, \text{ or } 5$; R_1R_u or $\text{R}_2\text{R}_v = \text{H, alkyl or aryl}$), O, S, SO, SO_2 , and NRNR_v (where $\text{RR}_v = \text{H, alkyl or aryl}$);

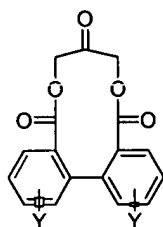
R_{11}, R_{12}, R_{13} , or R_{14} in formula (III) is selected from H, alkyl, halogenated alkyl, aryl, OROR_v (where $\text{RR}_v = \text{H, alkyl or aryl}$), OCOROCOR_v (where $\text{RR}_v = \text{H, alkyl or aryl}$), OCCOORCOOR_v (where $\text{RR}_v = \text{alkyl or aryl}$), $\text{OCONR}_1\text{R}_2\text{OCONR}_u\text{R}_v$ (where R_1R_u or $\text{R}_2\text{R}_v = \text{H, alkyl or aryl}$), $\text{OSiR}_1\text{R}_2\text{OSiR}_w\text{R}_x\text{R}_y$ (where R_1R_w , R_2R_x or $\text{R}_3\text{R}_y = \text{alkyl or aryl}$), and halogen;

R_{15}, R_{16}, R_{17} , or R_{18} in formula (III) is selected from H, alkyl, halogenated alkyl, aryl, COORCOOR_v (where $\text{RR}_v = \text{H, alkyl or aryl}$), and $\text{CONR}_1\text{R}_2\text{CONR}_u\text{R}_v$ (where R_1R_u or $\text{R}_2\text{R}_v = \text{H, alkyl or aryl}$);



R_{19} or R_{20} in formula (IV) is selected from alkyl, halogenated alkyl, aryl, $\text{CR}_1\text{R}_2\text{OCOR}_3\text{CR}_4\text{R}_5\text{OCOR}_6$ (where $\text{R}_1, \text{R}_5, \text{R}_2, \text{R}_4$ or $\text{R}_3, \text{R}_6 = \text{H}$, alkyl or aryl), $\text{CR}_1\text{R}_2\text{OCOO}\text{R}_3\text{CR}_4\text{R}_5\text{OCOO}\text{R}_6$ (where R_1, R_4 or $\text{R}_2, \text{R}_5 = \text{H}$, alkyl or aryl; $\text{R}_3, \text{R}_6 = \text{alkyl or aryl}$), $\text{CR}_1\text{R}_2\text{NR}_3\text{COOR}_4\text{CR}_5\text{R}_6\text{NR}_7\text{COOR}_8$ (where $\text{R}_1, \text{R}_5, \text{R}_2, \text{R}_4$ or $\text{R}_3, \text{R}_6 = \text{H}$, alkyl or aryl, $\text{R}_7, \text{R}_8 = \text{alkyl or aryl}$), $\text{CR}_1\text{R}_2\text{NR}_3\text{COR}_4\text{CR}_5\text{R}_6\text{NR}_7\text{COR}_8$ (where $\text{R}_1, \text{R}_2, \text{R}_3, \text{R}_5, \text{R}_6, \text{R}_7, \text{R}_8 = \text{H}$, alkyl or aryl), and $\text{CR}_1\text{R}_2\text{NR}_3\text{SO}_2\text{R}_4\text{CR}_5\text{R}_6\text{NR}_7\text{SO}_2\text{R}_8$ (where $\text{R}_1, \text{R}_2, \text{R}_3, \text{R}_5, \text{R}_6, \text{R}_7, \text{R}_8 = \text{H}$, alkyl or aryl; $\text{R}_4, \text{R}_8 = \text{alkyl or aryl}$); and

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Y in formula (V) is selected from H, alkyl, halogenated alkyl, aryl, NO_2 , CN, F, Cl, Br, I, COOR_q (where $\text{R}_q = \text{H}$ or alkyl), OR_v (where $\text{R}_v = \text{H}$, alkyl or aryl), OSO_2R_v (where $\text{R}_v = \text{H}$, alkyl or aryl), OSOR_v (where $\text{R}_v = \text{H}$, alkyl or aryl), OSR_v (where $\text{R}_v = \text{H}$, alkyl or aryl), SO_2R_v (where $\text{R}_v = \text{H}$, alkyl or aryl), SO_3R_v (where $\text{R}_v = \text{H}$, alkyl or aryl), SOON R_1R_2 R_uR_v (where R_1, R_u or $\text{R}_2, \text{R}_v = \text{H}$, alkyl or aryl), NR_1SOOR_2 NR_vSOOR_v (where $\text{R}_1, \text{R}_v = \text{H}$, alkyl or aryl; $\text{R}_2, \text{R}_v = \text{alkyl or aryl}$), NR_1SOR_2 NR_vSOR_v (where $\text{R}_1, \text{R}_v = \text{H}$, alkyl or aryl; $\text{R}_2, \text{R}_v = \text{alkyl or aryl}$), $\text{CR}_1\text{R}_2\text{OR}_3\text{CR}_4\text{R}_5\text{OR}_6$ (where $\text{R}_1, \text{R}_2, \text{R}_3, \text{R}_4, \text{R}_5$ or $\text{R}_3 = \text{H}$, alkyl or aryl), $\text{CR}_1(\text{OR}_2)_2\text{CR}_3(\text{OR}_4)_2$ (where $\text{R}_1, \text{R}_3 = \text{H}$ or alkyl; $\text{R}_2, \text{R}_4 = \text{alkyl}$), CF_3 , CF_2CF_3 , OTf, OTs, OCOR_v (where $\text{R}_v = \text{H}$, alkyl or aryl), and $\text{OSiR}_w\text{R}_x\text{R}_y$ (where $\text{R}_1, \text{R}_2, \text{R}_3, \text{R}_w, \text{R}_x$ or $\text{R}_y = \text{alkyl or aryl}$).

16. (Currently Amended) The method of claim 12 wherein said epoxidation reaction is carried out in a homogeneous solvent system ~~containing~~ selected from

dimethoxymethane-acetonitrile-water, acetonitrile-water, acetone-water, dioxane-water, dimethoxyethane-water, and tetrahydrofuran-water, or a biphasic solvent system ~~containing~~selected from dichloromethane-water, chloroform-water, benzene-water, toluene-water, dimethoxymethane-water, or diethylether-water, or mixtures thereof.

17. (Original) The method of claim 12 wherein said oxidizing reagent is selected from the group consisting of potassium peroxomonosulfate, sodium hypochlorite, sodium perborate, hydrogen peroxide, and peracids.

 18. (Original) The method of claim 17 wherein said epoxidation reaction is carried out using potassium peroxomonosulfate as an oxidizing agent.

19. (Original) The method of claim 12 wherein said epoxidation reaction is carried out at a temperature within the range from about -10 °C to about 40 °C.

20. (Original) The method of claim 19 wherein said epoxidation reaction is carried out at room temperature.

21. (Original) The method of claim 12 wherein said epoxidation reaction is carried out at a pH within the range from about 7.0 to about 12.0.

22. (Original) The method of claim 21 wherein said pH is within the range from about 7.0 to about 7.5.

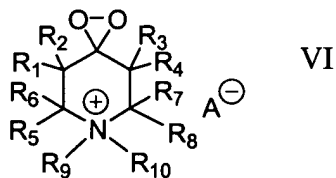
23. (Original) The method of claim 21 wherein said pH is controlled by using a pH-stat or a buffer.

24. (Currently Amended) The method of claim 23 wherein said buffer is selected from the ~~solutions~~group consisting of solutions of sodium bicarbonate, sodium carbonate, sodium borate, sodium hydrogenphosphate, sodium dihydrogenphosphate, sodium hydroxide, potassium hydrogenphosphate, potassium dihydrogenphosphate, potassium bicarbonate, ~~and~~ potassium carbonate, potassium hydroxide, and mixtures thereof.

25. (Original) The method of claim 12 wherein said epoxidation reaction provides said epoxides in at least about 5:1 β/α -epoxide ratio.

26. (Currently Amended) A method of producing mostly $5\beta,6\beta$ -epoxides of steroids from Δ^5 -unsaturated steroids by an epoxidation reaction using a dioxirane under conditions effective to generate epoxides,

wherein said dioxirane is selected from compounds of generic formula VI,



R_1 or R_4 in formula (VI) is selected from alkyl, halogenated alkyl, aryl, ~~OR~~ $\text{OR}_{\underline{y}}$ (where $\text{RR}_{\underline{y}}$ = H, alkyl or aryl), ~~OCOR~~ $\text{OCOR}_{\underline{y}}$ (where $\text{RR}_{\underline{y}}$ = H, alkyl or aryl), ~~OCCOR~~ $\text{OCCOR}_{\underline{y}}$ (where $\text{RR}_{\underline{y}}$ = alkyl or aryl), $\text{OCOOCH}_2\text{RR}_{\underline{z}}$ (where $\text{RR}_{\underline{z}}$ = aryl), ~~OCONR~~ $\text{OCONR}_{\underline{u}}\text{R}_{\underline{v}}$ (where $\text{R}_{\underline{u}}\text{R}_{\underline{v}}$ or $\text{R}_{\underline{z}}\text{R}_{\underline{y}}$ = H, alkyl or aryl), ~~OSiR~~ $\text{OSiR}_{\underline{w}}\text{R}_{\underline{x}}\text{R}_{\underline{y}}$ (where $\text{R}_{\underline{w}}\text{R}_{\underline{x}}$ or $\text{R}_{\underline{z}}\text{R}_{\underline{y}}$ = alkyl or aryl), and halogen;

R_2 or R_3 in formula (VI) is selected from H, alkyl, halogenated alkyl, aryl, ~~OR~~ $\text{OR}_{\underline{y}}$ (where $\text{RR}_{\underline{y}}$ = H, alkyl or aryl), ~~OCOR~~ $\text{OCOR}_{\underline{y}}$ (where $\text{RR}_{\underline{y}}$ = H, alkyl or aryl),

OCOROCOOR_y (where RR_y = alkyl or aryl), $\text{OCOOCH}_2\text{RR}_z$ (where RR_z = aryl),
 $\text{CONR}_1\text{R}_2\text{CONR}_u\text{R}_v$ (where R_1R_u or R_2R_v = H, alkyl or aryl), $\text{OSiR}_1\text{R}_2\text{R}_3\text{OSiR}_w\text{R}_x\text{R}_y$
 (where R_1R_w , R_2R_x or R_3R_y = alkyl or aryl), and halogen;

R_5 , R_6 , R_7 or R_8 in formula (VI) is selected from H, alkyl, halogenated alkyl, aryl,
 COORCOOR_y (where RR_y = H, alkyl or aryl), and $\text{CONR}_1\text{R}_2\text{CONR}_u\text{R}_v$ (where R_1R_u or
 R_2R_v = H, alkyl or aryl);

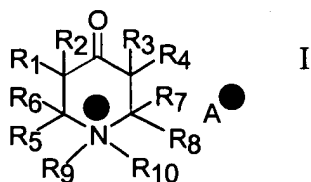
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R_9 or R_{10} in formula (VI) is selected from alkyl, halogenated alkyl, and aryl; and

A in formula (VI) is selected from halogen, OTf, BF_4 , OAc, NO_3 , BPh₄, PF_6 , and
 SbF_6 .

27. (Currently Amended) The method of claim 26 wherein said dioxirane is
 generated in situ from a ketone and an oxidizing agent selected from potassium
 peroxomonosulfate, sodium hypochlorite, sodium perborate, hydrogen peroxide, and
 peracids;


wherein said ketone is selected from compounds of generic formula I,



R_1 or R_4 in formula (I) is selected from alkyl, halogenated alkyl, aryl, OROR_y
 (where RR_y = H, alkyl or aryl), OCOROCOR_y (where RR_y = H, alkyl or aryl),
 OCOROCOOR_y (where RR_y = alkyl or aryl), $\text{OCOOCH}_2\text{RR}_z$ (where RR_z = aryl),

$\text{OCONR}_1\text{R}_2\text{OCONR}_u\text{R}_v$ (where R_1R_u or $\text{R}_2\text{R}_v = \text{H}$, alkyl or aryl), $\text{OSiR}_1\text{R}_2\text{R}_3\text{OSiR}_w\text{R}_x\text{R}_y$ (where R_1R_w , R_2R_x or $\text{R}_3\text{R}_y = \text{alkyl or aryl}$), and halogen;

R_2 or R_3 in formula (I) is selected from H, alkyl, halogenated alkyl, aryl, OROR_v (where $\text{RR}_v = \text{H}$, alkyl or aryl), OCOROCOR_v (where $\text{RR}_v = \text{H}$, alkyl or aryl), OCOOROCOCOR_v (where $\text{RR}_v = \text{alkyl or aryl}$), $\text{OCOOCH}_2\text{ROCOOCH}_2\text{R}$ (where $\text{RR}_z = \text{aryl}$), $\text{OCONR}_1\text{R}_2\text{OCONR}_u\text{R}_v$ (where R_1R_u or $\text{R}_2\text{R}_v = \text{H}$, alkyl or aryl), $\text{OSiR}_1\text{R}_2\text{R}_3\text{OSiR}_w\text{R}_x\text{R}_y$ (where R_1R_w , R_2R_x or $\text{R}_3\text{R}_y = \text{alkyl or aryl}$), and halogen;

 R_5 , R_6 , R_7 or R_8 in formula (I) is selected from H, alkyl, halogenated alkyl, aryl, COORCOOR_v (where $\text{RR}_v = \text{H}$, alkyl or aryl), and $\text{CONR}_1\text{R}_2\text{CONR}_u\text{R}_v$ (where R_1R_u or $\text{R}_2\text{R}_v = \text{H}$, alkyl or aryl);

R_9 or R_{10} in formula (I) is selected from alkyl, halogenated alkyl, and aryl; and

A in formula (I) is selected from halogen, OTf, BF_4 , OAc, NO_3 , BPh_4 , PF_6 , and SbF_6 .

28. (Original) The method of claim 26 wherein said epoxidation reaction is carried out in a solvent selected from acetonitrile, dimethoxymethane, acetone, dioxane, dimethoxyethane, tetrahydrofuran, dichloromethane, chloroform, benzene, toluene, diethylether, water, and mixtures thereof.

29. (Original) The method of claim 26 wherein said epoxidation reaction is carried out at a temperature within the range from about -40°C to about 40°C .

30. (Original) The method of claim 26 wherein said epoxidation reaction is carried out at a pH within the range from about 7.0 to about 12.0.

31. (Original) The method of claim 26 wherein said epoxidation reaction provides said epoxides in at least about 5:1 β/α -epoxide ratio.

32. (Original) A method of producing mostly 5 β ,6 β -epoxides of steroids from Δ^5 -unsaturated steroids having a substituent at the 3 α -position by an epoxidation reaction using a dioxirane under conditions effective to generate epoxides.

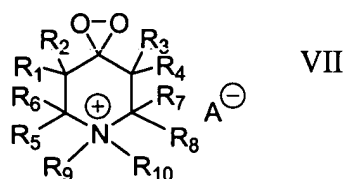
33. (Currently Amended) The method of claim 32 wherein said substituent is selected from OR_v (where $R_v = H$, alkyl or aryl), $O(CH_2)_nOR_v$ (where $n = 1, 2$ or 3 , $R_v = H$, alkyl or aryl), $O(CH_2)_mSO_nR_v$ (where $n = 1, 2$ or 3 ; $m = 0, 1$ or 2 ; $R_v = H$, alkyl or aryl), $OSiR_1R_2R_3$, $OSiR_wR_xR_y$ (where R_1, R_2 or R_3 , R_w, R_x or $R_y =$ alkyl or aryl), OSO_nR_v (where $n = 0, 1$ or 2 ; $R_v = H$, alkyl or aryl), OCO_nR_v (where $n = 1$ or 2 ; $R_v = H$, alkyl or aryl), $OCONR_1R_2$, $OCONR_uR_v$ (where R_1 or R_2 , R_u or $R_v = H$, alkyl or aryl), OPO_nR_v (where $n = 2$ or 3 ; $R_v =$ alkyl or aryl), NR_1R_2 , NR_uR_v (where R_1 or R_2 , R_u or $R_v = H$, alkyl or aryl), $NR_1CO_nR_2$, $NR_uCO_nR_v$ (where $n = 1$ or 2 ; R_1 or R_2 , R_u or $R_v = H$, alkyl or aryl), $NR_1CONR_2R_3$, $NR_1CONR_uR_v$ (where R_1, R_2 or R_3 , R_u, R_v or $R_v = H$, alkyl or aryl), $NR_1SO_nR_2$, $NR_vSO_nR_v$ (where $n = 1$ or 2 ; $R_1, R_v = H$, alkyl or aryl, $R_2, R_v =$ alkyl or aryl), $NPhth$ (Phth = phthaloyl group), $^+NR_1R_2R_3$, $^+NR_uR_v$ (where R_1, R_2 or R_3 , R_u, R_v or $R_v = H$, alkyl or aryl), $SiR_1R_2R_3$, SiR_uR_v (where R_1, R_2 or R_3 , R_u, R_v or $R_v = H$, alkyl or aryl), SO_nR_v (where $n = 0, 1$ or 2 ; $R_v = H$, alkyl or aryl), SCO_nR_v (where $n = 1$ or 2 ; $R_v = H$, alkyl or aryl), halogen, CN, NO_2 , alkyl, aryl, $COOR_v$ (where $R_v = H$, alkyl or aryl), and $CONR_1R_2$, $CONR_uR_v$ (where R_1 or R_2 , R_u or $R_v = H$, alkyl or aryl).

34. (Original) The method of claim 32 wherein said Δ^5 -unsaturated steroid having a substituent at the 3 α -position is selected from the group consisting of Δ^5 -unsaturated steroids having a ketal derivative of ketone group or a thioketal derivative of ketone group at the 3-position.

35. (Currently Amended) The method of claim 32 wherein said dioxirane is selected from the group consisting of compounds of generic formula VII, VIII, IX and X-₂,

wherein

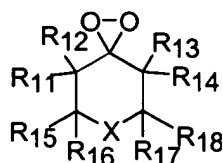
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Chm



R₁, R₂, R₃, or R₄ in formula (VII) is selected from H, alkyl, halogenated alkyl, aryl, $\Theta R \underline{OR}_v$ (where \underline{RR}_v = H, alkyl or aryl), $\Theta \underline{COROCOR}_v$ (where \underline{RR}_v = H, alkyl or aryl), $\Theta \underline{COOROCOR}_v$ (where \underline{RR}_v = alkyl or aryl), $\underline{OCOOCH}_2 \underline{RR}_z$ (where \underline{RR}_z = aryl), $\Theta \underline{CONR}_1 \underline{R}_2 \underline{OCONR}_u \underline{R}_v$ (where $\underline{R}_1 \underline{R}_u$ or $\underline{R}_2 \underline{R}_v$ = H, alkyl or aryl), $\Theta \underline{SiR}_1 \underline{R}_2 \underline{R}_3 \underline{OSiR}_w \underline{R}_x \underline{R}_y$ (where $\underline{R}_1 \underline{R}_w$, $\underline{R}_2 \underline{R}_x$ or $\underline{R}_3 \underline{R}_y$ = alkyl or aryl), and halogen;

R₅, R₆, R₇, R₈, R₉ or R₁₀, in formula (VII) is selected from H, alkyl, halogenated alkyl, aryl, $\underline{COORCOOR}_v$ (where \underline{RR}_v = H, alkyl or aryl), and $\underline{CONR}_1 \underline{R}_2 \underline{CONR}_u \underline{R}_v$ (where $\underline{R}_1 \underline{R}_u$ or $\underline{R}_2 \underline{R}_v$ = H, alkyl or aryl);

A in formula (VII) is selected from halogen, OTf, BF₄, OAc, NO₃, BPh₄, PF₆, and SbF₆;

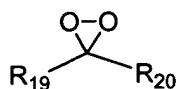


VIII

X in formula (VIII) is selected from $(\text{CR}_1\text{R}_2\text{CR}_u\text{R}_v)_n$ (where $n = 1, 2, 3, 4, \text{ or } 5$; R_1R_u or $\text{R}_2\text{R}_v = \text{H, alkyl or aryl}$), O, S, SO, SO₂, and NR_uNR_v (where $\text{R}_u = \text{H, alkyl or aryl}$);

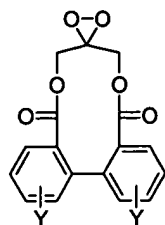
Allyl
 $\text{R}_{11}, \text{R}_{12}, \text{R}_{13}, \text{ or } \text{R}_{14}$ in formula (VIII) is selected from H, alkyl, halogenated alkyl, aryl, OR_uOR_v (where $\text{R}_u = \text{H, alkyl or aryl}$), $\text{OCOR}_u\text{OCOR}_v$ (where $\text{R}_u = \text{H, alkyl or aryl}$), $\text{OCOOCH}_2\text{R}_u$ (where $\text{R}_u = \text{alkyl or aryl}$), $\text{OCOOCH}_2\text{R}_u$ (where $\text{R}_u = \text{alkyl or aryl}$), $\text{OCONR}_1\text{R}_2\text{OCONR}_u\text{R}_v$ (where R_1R_u or $\text{R}_2\text{R}_v = \text{H, alkyl or aryl}$), $\text{OSiR}_1\text{R}_2\text{OSiR}_u\text{R}_v$ (where R_1R_u , R_2R_v or $\text{R}_3\text{R}_v = \text{alkyl or aryl}$), and halogen;

$\text{R}_{15}, \text{R}_{16}, \text{R}_{17}, \text{ or } \text{R}_{18}$ in formula (VIII) is selected from H, alkyl, halogenated alkyl, aryl, $\text{COOR}_u\text{COOR}_v$ (where $\text{R}_u = \text{H, alkyl or aryl}$), and $\text{CONR}_1\text{R}_2\text{CONR}_u\text{R}_v$ (where R_1R_u or $\text{R}_2\text{R}_v = \text{H, alkyl or aryl}$);



IX

R_{19} or R_{20} in formula (IX) is selected from alkyl, halogenated alkyl, aryl, $\text{CR}_1\text{R}_2\text{OCOR}_3$, $\text{CR}_1\text{R}_u\text{OCOR}_v$ (where $\text{R}_1, \text{R}_2, \text{ or } \text{R}_3, \text{R}_u, \text{ or } \text{R}_v = \text{H, alkyl or aryl}$), $\text{CR}_1\text{R}_2\text{OCOOCH}_2\text{R}_3$, $\text{CR}_1\text{R}_u\text{OCOOCH}_2\text{R}_v$ (where $\text{R}_1, \text{ or } \text{R}_2, \text{R}_u, \text{ or } \text{R}_v = \text{H, alkyl or aryl}$; $\text{R}_3, \text{R}_v = \text{alkyl or aryl}$), $\text{CR}_1\text{R}_2\text{NR}_3\text{COOR}_4$, $\text{CR}_1\text{R}_u\text{NR}_v\text{COOR}_v$ (where $\text{R}_1, \text{R}_2, \text{ or } \text{R}_3, \text{R}_u, \text{ or } \text{R}_v = \text{H, alkyl or aryl}$, $\text{R}_4, \text{R}_v = \text{alkyl or aryl}$), $\text{CR}_1\text{R}_2\text{NR}_3\text{COR}_4$, $\text{CR}_1\text{R}_u\text{NR}_v\text{COR}_v$ (where $\text{R}_1, \text{R}_2, \text{R}_3, \text{ or } \text{R}_4, \text{R}_u, \text{R}_v, \text{ or } \text{R}_v = \text{H, alkyl or aryl}$), $\text{CR}_1\text{R}_2\text{NR}_3\text{SO}_2\text{R}_4$, $\text{CR}_1\text{R}_u\text{NR}_v\text{SO}_2\text{R}_v$ (where $\text{R}_1, \text{R}_2, \text{R}_3, \text{ or } \text{R}_4, \text{R}_u, \text{R}_v, \text{ or } \text{R}_v = \text{H, alkyl or aryl}$; $\text{R}_4, \text{R}_v = \text{alkyl or aryl}$); and

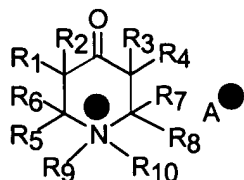


X

Y in formula (X) is selected from H, alkyl, halogenated alkyl, aryl, NO₂, CN, F, Cl, Br, I, COOR_q (where R_q = H or alkyl), OR_y (where R_y = H, alkyl or aryl), OSO₂R_y (where R_y = H, alkyl or aryl), OSOR_y (where R_y = H, alkyl or aryl), OSR_y (where R_y = H, alkyl or aryl), SO₂R_y (where R_y = H, alkyl or aryl), SO₃R_y (where R_y = H, alkyl or aryl), ~~SOON~~ ~~R₁R₂~~ ~~R_uR_v~~ (where ~~R₁~~ ~~R_u~~ or ~~R₂~~ ~~R_v~~ = H, alkyl or aryl), ~~NR₁SOOR₂~~ ~~NR_vSOOR_y~~ (where ~~R₁~~ ~~R_v~~ = H, alkyl or aryl; ~~R₂~~ ~~R_y~~ = alkyl or aryl), ~~NR₁SOOR₂~~ ~~NR_vSOOR_y~~ (where ~~R₁~~ ~~R_v~~ = H, alkyl or aryl; ~~R₂~~ ~~R_y~~ = alkyl or aryl), ~~CR₁R₂OR₃~~ ~~CR_uR_vOR_y~~ (where ~~R₁~~, ~~R₂~~ or ~~R₃~~ ~~R_u~~ or ~~R_v~~ = H, alkyl or aryl), ~~CR₁(OR₂)₂~~ ~~CR_u(OR_v)₂~~ (where ~~R₁~~ ~~R_u~~ = H or alkyl; ~~R₂~~ ~~R_v~~ = alkyl), CF₃, CF₂CF₃, OTf, OTs, OCOR_y (where R_y = H, alkyl or aryl), and ~~OSiR₁R₂R₃~~ ~~OSiR_xR_yR_z~~ (where ~~R₁~~, ~~R₂~~ or ~~R₃~~ ~~R_x~~, ~~R_y~~ or ~~R_z~~ = alkyl or aryl).

36. (Original) The method of claim 32 wherein said dioxirane is generated in situ from a ketone and an oxidizing agent selected from potassium peroxomonosulfate, sodium hypochlorite, sodium perborate, hydrogen peroxide, and peracids.

37. (Currently Amended) The method of claim 36 wherein said ketone is selected from the group consisting of compounds of generic formula II, III, IV, and V,

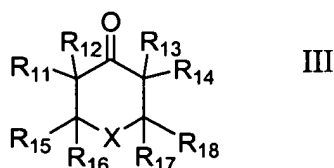


II

R_1, R_2, R_3 , or R_4 in formula (II) is selected from H, alkyl, halogenated alkyl, aryl, OROR_v (where $\text{RR}_v = \text{H}$, alkyl or aryl), OCOROCOR_v (where $\text{RR}_v = \text{H}$, alkyl or aryl), OCOROCOR_v (where $\text{RR}_v = \text{alkyl}$ or aryl), $\text{OCOOCH}_2\text{RR}_z$ (where $\text{RR}_z = \text{aryl}$), $\text{OCONR}_1\text{R}_2\text{OCONR}_u\text{R}_v$ (where R_1R_u or $\text{R}_2\text{R}_v = \text{H}$, alkyl or aryl), $\text{OSiR}_1\text{R}_2\text{R}_3\text{OSiR}_w\text{R}_x\text{R}_y$ (where $\text{R}_1\text{R}_w, \text{R}_2\text{R}_x$ or $\text{R}_3\text{R}_y = \text{alkyl}$ or aryl), and halogen;

R_5, R_6, R_7, R_8, R_9 or R_{10} in formula (II) is selected from H, alkyl, halogenated alkyl, aryl, COORCOOR_v (where $\text{RR}_v = \text{H}$, alkyl or aryl), and $\text{CONR}_1\text{R}_2\text{CONR}_u\text{R}_v$ (where R_1R_u or $\text{R}_2\text{R}_v = \text{H}$, alkyl or aryl);

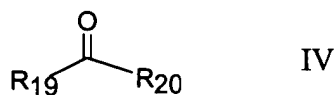
A in formula (II) is selected from halogen, OTf, BF_4 , OAc, NO_3 , BPh_4 , PF_6 , and SbF_6 ;



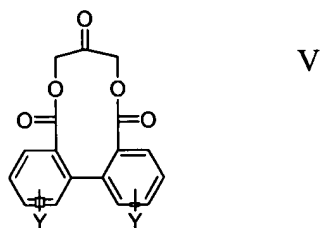
X in formula (III) is selected from $(\text{CR}_1\text{R}_2\text{CR}_u\text{R}_v)_n$ (where $n = 1, 2, 3, 4$, or 5 ; R_1R_u or $\text{R}_2\text{R}_v = \text{H}$, alkyl or aryl), O, S, SO, SO_2 , and NRNR_v (where $\text{RR}_v = \text{H}$, alkyl or aryl);

R_{11}, R_{12}, R_{13} , or R_{14} in formula (III) is selected from H, alkyl, halogenated alkyl, aryl, OROR_v (where $\text{RR}_v = \text{H}$, alkyl or aryl), OCOROCOR_v (where $\text{RR}_v = \text{H}$, alkyl or aryl), OCOROCOR_v (where $\text{RR}_v = \text{alkyl}$ or aryl), $\text{OCOOCH}_2\text{RR}_z$ (where $\text{RR}_z = \text{aryl}$), $\text{OCONR}_1\text{R}_2\text{OCONR}_u\text{R}_v$ (where R_1R_u or $\text{R}_2\text{R}_v = \text{H}$, alkyl or aryl), $\text{OSiR}_1\text{R}_2\text{R}_3\text{OSiR}_w\text{R}_x\text{R}_y$ (where $\text{R}_1\text{R}_w, \text{R}_2\text{R}_x$ or $\text{R}_3\text{R}_y = \text{alkyl}$ or aryl), and halogen;

R_{15} , R_{16} , R_{17} , or R_{18} in formula (III) is selected from H, alkyl, halogenated alkyl, aryl, COORCOOR_v (where $\text{RR}_v = \text{H}$, alkyl or aryl), and $\text{CONR}_1\text{R}_2\text{CONR}_u\text{R}_v$ (where R_1R_u or $\text{R}_2\text{R}_v = \text{H}$, alkyl or aryl);



R_{19} or R_{20} in formula (IV) is selected from alkyl, halogenated alkyl, aryl, $\text{CR}_1\text{R}_2\text{OCOR}_3$, $\text{CR}_1\text{R}_u\text{OCOR}_v$ (where R_1 , R_2 or R_3 , R_1 , R_u or $\text{R}_v = \text{H}$, alkyl or aryl), $\text{CR}_1\text{R}_2\text{OCOO}\text{R}_3$, $\text{CR}_u\text{R}_v\text{OCOO}\text{R}_v$ (where R_1 , R_u or R_2 , $\text{R}_v = \text{H}$, alkyl or aryl; R_3 , $\text{R}_v = \text{alkyl}$ or aryl), $\text{CR}_1\text{R}_2\text{NR}_3\text{COOR}_4$, $\text{CR}_1\text{R}_u\text{NR}_v\text{COOR}_v$ (where R_1 , R_2 or R_3 , R_1 , R_u or $\text{R}_v = \text{H}$, alkyl or aryl, R_4 , $\text{R}_v = \text{alkyl}$ or aryl), $\text{CR}_1\text{R}_2\text{NR}_3\text{COR}_4$, $\text{CR}_u\text{R}_v\text{NR}_v\text{COR}_v$ (where R_1 , R_2 , R_3 or R_4 , R_5 , R_1 , R_u or $\text{R}_v = \text{H}$, alkyl or aryl), $\text{CR}_1\text{R}_2\text{NR}_3\text{SO}_2\text{R}_4$, $\text{CR}_u\text{R}_v\text{NR}_v\text{SO}_2\text{R}_v$ (where R_1 , R_2 or R_3 , R_1 , R_u or $\text{R}_v = \text{H}$, alkyl or aryl; R_4 , $\text{R}_v = \text{alkyl}$ or aryl); and



Y in formula (V) is selected from H, alkyl, halogenated alkyl, aryl, NO_2 , CN , F , Cl , Br , I , COORCOOR_q (where $\text{RR}_q = \text{H}$ or alkyl), OROR_v (where $\text{RR}_v = \text{H}$, alkyl or aryl), OSO_2RR_v (where $\text{RR}_v = \text{H}$, alkyl or aryl), OSOROSOR_v (where $\text{RR}_v = \text{H}$, alkyl or aryl), OSROSOR_v (where $\text{RR}_v = \text{H}$, alkyl or aryl), SO_2RR_v (where $\text{RR}_v = \text{H}$, alkyl or aryl), SO_3RR_v (where $\text{RR}_v = \text{H}$, alkyl or aryl), $\text{SOONR}_1\text{R}_2\text{R}_u\text{R}_v$ (where R_1 or R_2 , R_u or $\text{R}_v = \text{H}$, alkyl or aryl), $\text{NR}_1\text{SOOR}_2\text{NR}_v\text{SOOR}_v$ (where R_1 , $\text{R}_v = \text{H}$, alkyl or aryl; R_2 , $\text{R}_v = \text{alkyl}$ or aryl), $\text{NR}_1\text{SOR}_2\text{NR}_v\text{SOR}_v$ (where R_1 , $\text{R}_v = \text{H}$, alkyl or aryl; R_2 , $\text{R}_v = \text{alkyl}$ or aryl),

$\text{CR}_1\text{R}_2\text{OR}_3$, $\text{CR}_1\text{R}_u\text{OR}_v$ (where R_1, R_2 or R_3 , R_u , R_v or R_v = H, alkyl or aryl), $\text{CR}_1(\text{OR}_2)_2$, $\text{CR}_q(\text{OR}_p)_2$ (where R_1, R_q = H or alkyl; R_2, R_p = alkyl), CF_3 , CF_2CF_3 , OTf, OTs, OCOR_v (where R_v = H, alkyl or aryl), and $\text{OSiR}_1\text{R}_2\text{R}_3$, $\text{OSiR}_w\text{R}_x\text{R}_y$ (where R_1, R_2 or R_3 , R_w, R_x or R_y = alkyl or aryl).

38. (Original) The method of claim 32 wherein said epoxidation reaction is carried out in a solvent selected from acetonitrile, dimethoxymethane, acetone, dioxane, dimethoxyethane, tetrahydrofuran, dichloromethane, chloroform, benzene, toluene, diethylether, water and mixtures thereof.

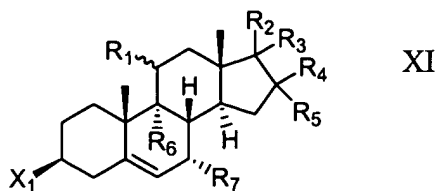
39. (Original) The method of claim 32 wherein said epoxidation reaction is carried out at a temperature within the range from about -40°C to about 40°C .

40. (Original) The method of claim 32 wherein said epoxidation reaction is carried out at a pH within the range from about 7.0 to about 12.0.

41. (Original) The method of claim 32 wherein said epoxidation reaction provides said epoxides in at least about 5:1 β/α -epoxide ratio.

42. (Currently Amended) A method comprising:

producing mostly $5\beta,6\beta$ -epoxides of steroids by epoxidation reactions of Δ^5 -unsaturated steroids of generic formula XI catalyzed by ketones of generic formula XII, wherein



X_1 in formula (XI) is selected from H, ΘROR_q (where $R_q = H$ or alkyl), OCH_2OCH_3 , $\Theta COROCOR_y$ (where $R_y = \text{alkyl or aryl}$), $\Theta SiR_w OSiR_x R_y$ (where R_w , R_x or $R_y = \text{alkyl or aryl}$), halogen, CN, alkyl, aryl, and $\Theta ORCOOR_y$ (where $R_y = H, \text{alkyl or aryl}$);

R_1 in formula (XI) is selected from H, ΘROR_q (where $R_q = H$ or alkyl), $\Theta COROCOR_y$ (where $R_y = \text{alkyl or aryl}$), OCH_2OCH_3 , halogen, CF_3 , and CF_2CF_3 ;

R_2 and R_3 in formula (XI) are each selected from the group consisting of H, alkyl, aryl, halogen, ΘROR_q (where $R_q = H$ or alkyl), $\Theta COROCOR_y$ (where $R_y = \text{alkyl or aryl}$), $\Theta SiR_w OSiR_x R_y$ (where R_w , R_x or $R_y = \text{alkyl or aryl}$), $\Theta ORCOR_p$ (where $R_p = \text{alkyl}$), $COCH_2\Theta ROR_q$ (where $R_q = H$ or alkyl), $COCH_2\Theta COROCOR_y$ (where $R_y = \text{alkyl or aryl}$), $COCH_2F$, $\Theta ORCOOR_q$ (where $R_q = H$ or alkyl), $C(OCH_2CH_2O)R_p$ (where $R_p = \text{alkyl}$), $C(OCH_2CH_2O)CH_2\Theta ROR_q$ (where $R_q = H$ or alkyl), $C(OCH_2CH_2O)CH_2\Theta COROCOR_y$ (where $R_y = \text{alkyl or aryl}$), and $C(OCH_2CH_2O)CH_2F$; or, are selected from the group consisting of O, OCH_2CH_2O , and $OCH_2CH_2CH_2O$;

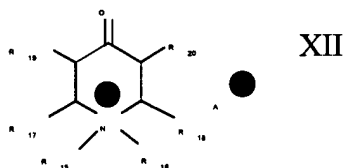
R_4 in formula (XI) is selected from H, C_1-C_4 alkyl, halogen, ΘROR_q (where $R_q = H$ or alkyl), $\Theta COROCOR_y$ (where $R_y = \text{alkyl or aryl}$), and $\Theta SiR_w OSiR_x R_y$ (where R_w , R_x or $R_y = \text{alkyl or aryl}$);

R_5 in formula (XI) is selected from H, C_1 – C_4 alkyl, halogen, ΘROR_q (where RR_q = H or alkyl), $\Theta C(OR)OCOR_y$ (where RR_y = alkyl or aryl), and $\Theta SiR_w OSiR_w' R_x R_y'$ (where $R_x R_w'$, $R_x R_y'$ or $R_x R_y'$ = alkyl or aryl);

R_6 in formula (XI) is selected from H, halogen, ΘROR_q (where R_q = H or alkyl), and $\Theta C(OR)OCOR_y$ (where RR_y = alkyl or aryl);

R_7 in formula (XI) is selected from H, halogen, ΘROR_q (where RR_q = H or alkyl), and $\Theta C(OR)OCOR_y$ (where RR_y = alkyl or aryl);

Alt
cmf



R_{15} and R_{16} in formula (XII) are each selected from alkyl and aryl;

R_{17} and R_{18} in formula (XII) are each selected from H, alkyl, aryl, $\Theta C(OR)COOR_y$ (where RR_y = H, alkyl or aryl), and $\Theta CONR_u R_v CONR_u R_v$ (where $R_u R_v$ or $R_u R_v$ = H, alkyl or aryl);

R_{19} and R_{20} in formula (XII) are each selected from C_1 – C_4 alkyl, halogenated alkyl, and halogen; and

A in formula (XII) is selected from OTf, BF_4 , OAc, NO_3 , BPh_4 , PF_6 , and SbF_6 .

43. (Currently Amended) The method of claim 42 wherein said C_1 – C_4 alkyl is selected from the group consisting of methyl, ethyl, normal-propyl, iso-propyl, normal-

butyl, iso-butyl, sec-butyl, and tert-butyl; and said aryl is selected from the group consisting of phenyl, substituted phenyl, naphthyl, and substituted naphthyl groups.

44. (Original) The method of claim 42 wherein said epoxidation reactions are carried out in a homogeneous solvent system selected from the group consisting of dimethoxymethane-acetonitrile-water, acetonitrile-water, acetone-water, dioxane-water, dimethoxyethane-water, tetrahydrofuran-water, and mixtures thereof.

45. (Currently Amended) The method of claim 42 wherein said epoxidation reactions are carried out in a biphasic solvent system selected from the group consisting of dichloromethane-water, chloroform-water, benzene-water, toluene-water, dimethoxymethane-water, ~~or~~ and diethylether-water, and mixtures thereof.

46. (Original) The method of claim 42 wherein said oxidizing reagent is selected from the group consisting of potassium peroxomonosulfate, sodium hypochlorite, sodium perborate, hydrogen peroxide, and peracids.

47. (Original) The method of claim 42 wherein said epoxidation reactions are carried out at a temperature within the range from about -10 °C to about 40 °C.

48. (Original) The method of claim 47 wherein said epoxidation reactions are carried out at room temperature.

49. (Original) The method of claim 42 wherein said epoxidation reactions are carried out at a pH within the range from about 7.0 to about 12.0.

50. (Original) The method of claim 49 wherein said pH is within the range from 7.0 to 7.5.

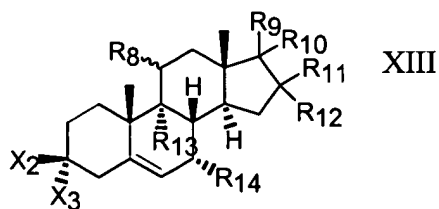
51. (Original) The method of claim 49 wherein said pH is controlled by using a pH-stat or a buffer.

52. (Currently Amended) The method of claim 51 wherein said buffer is selected from the group consisting of sodium bicarbonate, sodium carbonate, sodium borate, sodium hydrogenphosphate, sodium dihydrogenphosphate, sodium hydroxide, potassium hydrogenphosphate, potassium dihydrogenphosphate, potassium bicarbonate, potassium carbonate, potassium hydroxide, ~~or~~ and mixtures thereof.

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53. (Currently Amended) A method comprising:

producing mostly 5 β ,6 β -epoxides of steroids by epoxidation reactions of Δ^5 -unsaturated steroids of generic formula XIII catalyzed by ketones of generic formula XIV, XV, XVI, and XVII, wherein



X₂ in formula (XIII) is selected from the group consisting of H, ~~O~~ROR_q (where R_q = H or alkyl), OCH₂OCH₃, ~~O~~COROCOR_y (where R_y = alkyl or aryl), ~~O~~SiR_uOSiR_w'R₂R_x'R₃R_y' (where R_uR_w', R₂R_x' or R₃R_y' = alkyl or aryl), halogen, CN, alkyl, aryl, and ~~C~~OROCOR_y (where R_y = H, alkyl or aryl), and,

X₃ in formula (XIII) is selected from the group consisting of $\Theta R \underline{OR}_q$ (where \underline{RR}_q = H or alkyl), OCH_2OCH_3 , $\Theta C \underline{OROCOR}_y$ (where \underline{RR}_y = alkyl or aryl), $\Theta Si \underline{R}_1 \underline{OSiR}_w' \underline{R}_2 \underline{R}_x' \underline{R}_3 \underline{R}_y'$ (where $\underline{R}_1 \underline{R}_w'$, $\underline{R}_2 \underline{R}_x'$ or $\underline{R}_3 \underline{R}_y'$ = alkyl or aryl), halogen, CN, NO₂, alkyl, and aryl; or,

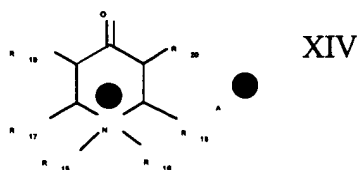
X₂ and X₃ in formula (XIII) are selected from the group consisting of O, OCH_2CH_2O , and $OCH_2CH_2CH_2O$;

R₈ in formula (XIII) is selected from H, $\Theta R \underline{OR}_q$ (where \underline{RR}_q = H or alkyl), $\Theta C \underline{OROCOR}_y$ (where \underline{RR}_y = alkyl or aryl), OCH_2OCH_3 , halogen, CF₃, and CF₂CF₃;

R₉ and R₁₀ in formula (XIII) are each selected from the group consisting of H, alkyl, aryl, halogen, $\Theta R \underline{OR}_q$ (where \underline{RR}_q = H or alkyl), $\Theta C \underline{OROCOR}_y$ (where \underline{RR}_y = alkyl or aryl), $\Theta Si \underline{R}_1 \underline{OSiR}_w' \underline{R}_2 \underline{R}_x' \underline{R}_3 \underline{R}_y'$ (where $\underline{R}_1 \underline{R}_w'$, $\underline{R}_2 \underline{R}_x'$ or $\underline{R}_3 \underline{R}_y'$ = alkyl or aryl), $\Theta C \underline{ORCOR}_p$ (where \underline{RR}_p = alkyl), $COCH_2 \Theta R \underline{OR}_q$ (where \underline{RR}_q = H or alkyl), $COCH_2 \Theta C \underline{OROCOR}_y$ (where \underline{RR}_y = alkyl or aryl), $COCH_2F$, $\Theta C \underline{ORCOOR}_q$ (where \underline{RR}_q = H or alkyl), $C(OCH_2CH_2O) \underline{RR}_p$ (where \underline{RR}_p = alkyl), $C(OCH_2CH_2O)CH_2 \Theta R \underline{OR}_q$ (where \underline{RR}_q = H or alkyl), $C(OCH_2CH_2O)CH_2 \Theta C \underline{OROCOR}_y$ (where \underline{RR}_y = alkyl or aryl), and $C(OCH_2CH_2O)CH_2F$; or R₉ and R₁₀ in formula (XIII) are selected from the group consisting of O, OCH_2CH_2O , and $OCH_2CH_2CH_2O$;

R₁₁ and R₁₂ in formula (XIII) are each selected from the group consisting of H, C₁–C₄ alkyl, halogen, $\Theta R \underline{OR}_q$ (where \underline{RR}_q = H or alkyl), $\Theta C \underline{OROCOR}_y$ (where \underline{RR}_y = alkyl or aryl), and $\Theta Si \underline{R}_1 \underline{OSiR}_w' \underline{R}_2 \underline{R}_x' \underline{R}_3 \underline{R}_y'$ (where $\underline{R}_1 \underline{R}_w'$, $\underline{R}_2 \underline{R}_x'$ or $\underline{R}_3 \underline{R}_y'$ = alkyl or aryl);

R_{13} and R_{14} in formula (XIII) are each selected from the group consisting of H, halogen, OROR_q (where $\text{RR}_q = \text{H}$ or alkyl), and OCOROCOR_y (where $\text{RR}_y = \text{alkyl}$ or aryl);

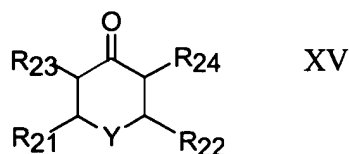


R_{15} or R_{16} in formula (XIV) is selected from alkyl and aryl;

R_{17} or R_{18} in formula (XIV) is selected from H, alkyl, aryl, COORCOOR_y (where $\text{RR}_y = \text{H}$, alkyl or aryl), and $\text{CONR}_u\text{CONR}_v$ (where R_uR_v or $\text{R}_2\text{R}_v = \text{H}$, alkyl or aryl);

R_{19} or R_{20} in formula (XIV) is selected from H, $\text{C}_1\text{--C}_4$ alkyl, halogenated alkyl, and halogen; and

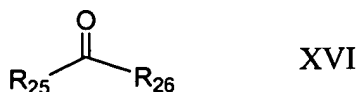
A in formula (XIV) is selected from OTf, BF_4 , OAc, NO_3 , BPh_4 , PF_6 , and SbF_6 ;



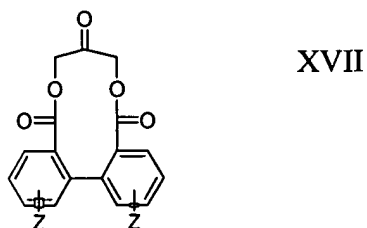
Y in formula (XV) is selected from CH_2 , O, S, SO, SO_2 , and NRNR_q (where $\text{RR}_q = \text{H}$ or alkyl);

R_{21} or R_{22} in formula (XV) is selected from H, alkyl, aryl, COORCOOR_y (where $\text{RR}_y = \text{H}$, alkyl or aryl), and $\text{CONR}_u\text{CONR}_v$ (where R_uR_v or $\text{R}_2\text{R}_v = \text{H}$, alkyl or aryl);

R_{23} or R_{24} in formula (XV) is selected from H, halogen, $\text{C}_1\text{--C}_4$ alkyl, halogenated alkyl, and OCOROCOR_y (where $\text{RR}_y = \text{alkyl}$ or aryl);



R_{25} or R_{26} in formula (XVI) is selected from C_1 – C_4 alkyl, halogenated alkyl, $\text{CH}_2\text{OCOROCOR}_y$ (where RR_y = alkyl or aryl); and



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Z in formula (XVII) is selected from H , C_1 – C_4 alkyl, aryl, NO_2 , CN , F , Cl , Br , I , COORCOOR_p (where RR_p = alkyl), CH_2OROR_q (where RR_q = H or alkyl), $\text{CH}(\text{OROR}_p)_2$ (where RR_p = alkyl), CF_3 , CF_2CF_3 , OTf , OTs , OCOROCOR_y (where RR_y = alkyl or aryl), and $\text{OSiR}_w\text{R}_x\text{R}_y$ (where R_w , R_x or R_y = alkyl or aryl).

54. (Currently Amended) The method of claim 53 wherein said C_1 – C_4 alkyl is selected from the group consisting of methyl, ethyl, normal-propyl, iso-propyl, normal-butyl, iso-butyl, sec-butyl, and tert-butyl; and said aryl is selected from the group consisting of phenyl, substituted phenyl, naphthyl, and substituted naphthyl groups.

55. (Original) The method of claim 53 wherein said epoxidation reactions are carried out in a homogeneous solvent system selected from the group consisting of dimethoxymethane-acetonitrile-water, acetonitrile-water, acetone-water, dioxane-water, dimethoxyethane-water, and tetrahydrofuran-water, and mixtures thereof.

56. (Currently Amended) The method of claim 53 wherein said epoxidation reactions are carried out in a biphasic solvent system selected from the group consisting

of dichloromethane-water, chloroform-water, benzene-water, toluene-water, dimethoxymethane-water, ~~or~~and diethylether-water, and mixtures thereof.

57. (Original) The method of claim 53 wherein said oxidizing reagent is selected from the group consisting of potassium peroxomonosulfate, sodium hypochlorite, sodium perborate, hydrogen peroxide, and peracids.

58. (Original) The method of claim 53 wherein said epoxidation reactions are carried out at a temperature within the range from about -10 °C to about 40 °C.

59. (Original) The method of claim 58 wherein said epoxidation reactions are carried out at room temperature.

60. (Original) The method of claim 53 wherein said epoxidation reactions are carried out at a pH within the range from about 7.0 to about 12.0.

61. (Original) The method of claim 60 wherein said pH is within the range from 7.0 to 7.5.

62. (Original) The method of claim 60 wherein said pH is controlled by using a pH-stat or a buffer.

63. (Currently Amended) The method of claim 62 wherein said buffer is selected from the group consisting of sodium bicarbonate, sodium carbonate, sodium borate, sodium hydrogenphosphate, sodium dihydrogenphosphate, sodium hydroxide, potassium hydrogenphosphate, potassium dihydrogenphosphate, potassium bicarbonate, potassium carbonate, potassium hydroxide, ~~or~~and mixtures thereof.